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ARCHIVES

OF

THE MIDDLESEX HOSPITAL

CLINICAL SERIES No. XIV.

(BEING THE THIRTY-SECOND VOLUME OF THE ARCHIVES)

32

EDITED BY

W. SAMPSON HANDLEY AND VICTOR BONNEY

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BEING THE THIRTY-SECOND VOLUME OF THE ARCHIVES

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Volumes dealing with the special work of the Cancer Department will be produced under the direction of the Cancer Investigation Committee.

PREFACE.

THESE Clinical Reports are intended to embody the teaching of the Hospital in respect of the latest developments in Medicine and Surgery, by which means it is hoped to make them a real help to old students of the School in dealing with the complex problems of every-day practice.

It is intended in future to issue the Clinical Archives twice annually.

By an arrangement with the Committee of The Middlesex Hospital Club every member resident in the British Isles will receive twice a year a copy of the Clinical Archives as one of the privileges of his membership. Members may also obtain, free of cost, the Reports of the Cancer Research Laboratories, **provided they notify the Director of the Cancer Research Laboratories in writing of their desire to receive these Reports.**

For others desirous of possessing them, it has been decided to accept a nominal subscription of half a guinea per annum for the volumes issued during the year, inclusive of that dealing with the special work of the Cancer Investigation Department.

ARCHIVES
OF
THE MIDDLESEX HOSPITAL.

TWO CASES OF BRONCHIECTASIS FOLLOWING OPERATION FOR THE REMOVAL OF TONSILS AND ADENOIDS.

By E. A. COCKAYNE, M.D., M.R.C.P.,
ASSISTANT PHYSICIAN TO THE HOSPITAL.

During the past year two cases of bronchiectasis, remarkably similar in their origin and development, have come under my notice. I am indebted to Dr. Pasteur for permission to publish the notes of the first case, and did not see the boy myself until I had charge of him for a short time during his second stay in the hospital. I was fortunately able to follow the progress of the second case from the beginning and make examinations at frequent intervals.

Case 1.

F. M., aged 15, office boy, admitted to Broderip Ward with a history that he had attended the out-patient department since January on account of deafness in both ears, and mouth breathing.

On April 23rd Mr. Hastings enucleated the tonsils and removed some adenoids. The heart and lungs on admission were normal.

The temperature rose to 100° F. on April 25th and to 102° F. on April 28th. The chest was normal. The temperature remained raised until May 26th.

On May 6th Dr. Pasteur examined the chest and found no abnormal physical signs.

On May 28th there was impaired resonance over the right lower lobe behind, with a few râles and a friction sound near the inferior angle of the scapula. There was pain also in this situation.

June 8.—No tubercle bacilli in sputum, which was scanty and muco-purulent.

June 17.—No friction and no pain. Discharged improved in general health to Clacton.

X-ray examinations shewed no opaque foreign body.

July 31.—Readmitted on account of a rise of temperature three days previously.

On admission flushed and thin. T. 101·6, R. 28., P. 138. Fingers not clubbed. Cough and pain on right side.

Chest: Movement equal.

Right side *in front.* Below 4th space.	Vocal vibrations diminished. Impaired note on percussion. Breath-sounds weak, with a few bubbling râles. Vocal resonance diminished.
behind. Below 7th space.	Vocal resonance diminished. Impaired percussion, with weak breath-sounds, and a few clicking râles in 8th and 9th spaces.

Aug. 6.—Sputum offensive, but contained no tubercle bacilli. No added sounds, but physical signs otherwise unchanged. Creosote treatment was begun.

Aug. 16.—Fingers noticeably clubbed.

Sep. 12.—Dulness had increased downwards, and there are more clicking râles.

Oct. 1.—Slight hæmoptysis.

Oct. 4.—Sputum thin, muco-purulent and blood-streaked, but not offensive. Breath offensive.

He was discharged on October 6th.

Case 2.

J. M., aged 6, a Jewish boy, came to the hospital on October 15th, 1913, with a history that he had had his tonsils and adenoids removed on October 7th at a general hospital on account of chronic enlargement, and had suffered since with cough, pain in the chest, and malaise.

He looked pale and ill, with sordes on his lips and a dirty tongue. Temperature 100·2 F., respirations not quickened. The throat appeared quite healthy. No abnormal physical signs were found in the chest. There was constipation.

He was treated with calomel, and a mixture of sodium salicylate and potassium chlorate.

Oct. 18.—Looked ill. Furred tongue. Paroxysmal cough. Temperature 99·6 F. Chest normal.

Oct. 22.—Condition unchanged. No abnormal physical signs in chest.

Oct. 25.—Had a very severe paroxysm of coughing and brought up a little clear sticky mucus streaked with blood. Slight curving of the finger nails, but no increase in size of pulp of finger tips. Skin of finger tips shiny, but not cyanosed.

There was slight diminution of movement of right side of chest, with weak breath-sounds at the base and crepitations near the inferior angle of the scapula.

X-ray taken shewed no foreign body or other abnormal appearance.

Creosote was given with cod-liver oil, and a tentative diagnosis of bronchiectasis was made.

Nov. 1.—Physical signs unchanged.

Nov. 5.—On right side of chest weak breath-sounds and definite impairment of note on percussion from a point just above and internal to the angle of the scapula to a point just below it. A few crepitations below this point. Urine contained no albumin. The temperature was normal for the first time, but there was loss of flesh, and the boy still looked pale and ill. There was no cyanosis.

Nov. 16.—X-ray screen examination shewed diminished movement of right side of diaphragm. Tubular breathing was heard near angle of right scapula, and the temperature was 100·2° F.

He was sent to a convalescent home, and on his return still looked thin and ill.

He never coughed up sputum except on the one occasion in the out-patient room.

At the right base there were still weak breath-sounds, impaired percussion note, and some crackling râles were heard near the inferior angle of the scapula.

There was no alteration in the shape of the chest, but the movement was deficient on the right side.

The finger tips were slightly cyanosed, the curving of nails had increased, and the pulp was now definitely swollen.

May 24.—Has been in the country for a month taking creosote in capsules. He now coughs up a little muco-purulent sputum which is odourless, but the breath is very offensive. Deficient movement of chest on right side with impaired note. Weak breath-sounds, and diminished vocal fremitus and resonance. No added sounds. The fingers now are very definitely clubbed.

I have examined some of the literature, including the lists given by Hoffmann and Preobrashensky, but have not succeeded in finding any parallel case; and in view of the great number of operations for the removal of tonsils and adenoid vegetations performed every day, bronchiectasis must be a very rare sequel.

In both cases before any physical signs developed there was a period characterised by malaise, pyrexia and paroxysmal cough.

The changes taking place in the lung gave rise to abnormal physical signs within three weeks of operation in the younger boy and in a month in the elder.

In the younger boy the first signs of clubbing of the fingers appeared in eighteen days after operation, and at first only affected the nails and caused no thickening of the finger pulp. Definite swelling of the soft parts of the finger tips was noticed within seven weeks. In the elder boy clubbing was well marked in about four months.

Clubbing of the extremities rarely occurs so quickly in bronchiectasis, but in empyema Samuel West noted a full development of the condition in a fortnight and Saundby in three weeks.

To explain the connection between the changes in the lung and the operation, we must suppose either that a small clot of blood or a piece of the adenoid vegetation was inspired into a bronchus and acted as a foreign body.

Liquid blood containing organisms would probably have reached the alveoli of the lung and caused broncho-pneumonia.

A number of instances of bronchiectasis following the lodgement of a foreign body in a bronchus are on record, and it is the commonest sequel to such an accident. These foreign bodies are usually hard, but the same condition is caused by a soft one, such as a small piece of meat or a boiled pea. The X-ray examination in both cases excludes the possibility of any foreign body capable of casting a shadow.

It must be admitted that little light is thrown on the much vexed question of the pathology of bronchiectasis.

There was an absence of dyspnœa and of the signs of bronchitis and broncho-pneumonia during the development of the disease, and there were few râles even later on.

There was no sputum until the condition had advanced considerably, and this prevented a bacteriological examination.

All these facts suggest that important pathological changes took place in the deeper tissues of the bronchi, and caused weakening of the muscle and elastic tissue without any widespread concomitant inflammation of the bronchial mucous membrane.

Pleurisy appeared later, and was undoubtedly secondary.

On the whole, these cases support the theory that weakening of the bronchial wall is the chief factor in the production of bronchiectatic cavities in the lungs.

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THREE CASES OF ACUTE INTRA-OCULAR INFLAMMATION TREATED WITH SENSITISED VACCINES.

By B. T. LANG, B.C., F.R.C.S.

Of recent additions to prophylactic and curative medicine, vaccine therapy has proved to be one of the most valuable. It has been observed, however, that all vaccines are not equally efficacious. This has been shewn to depend partly on the type of the disease and partly on the nature of the infecting organism. In many kinds of chronic disease vaccines seem to be of great use in helping the patient to recover. But in all types of acute inflammation, especially those caused by streptococci, pneumococci, and coliform organisms, vaccines seem to have been only partially successful. This is apparently dependent on the presence of certain poisons within the bodies of the killed organisms of the vaccine, and by no known means can these poisons be removed. It is these very poisons that are directly causing the patient's critical condition, and a further dose does not assist him at this stage.

In treating these cases, therefore, it has been customary to inject into the patient the sera of animals that have been rendered immune to the organism in question. These substances, however, are foreign to the human system, and are therefore quickly eliminated. The result is that the immunity so conferred is of low degree and of short duration.

The poisons contained in the vaccine can, however, be largely, if not completely, neutralised by the addition of the appropriate anti-serum. The injection of a vaccine so treated does not in any way disturb the patient's general condition, while under its influence the human tissues are capable of forming immune bodies with great rapidity. Apparently the process begins as soon as the vaccine is injected, and a high degree of immunity is obtained by the third day.

Such are the sensitised vaccines of Besredka. He, however, removes the excess of the immune serum from the vaccine, as it has been found that the presence of the serum decreases the potency of the vaccine. At the same time, by washing the vaccine free from the serum by saline he is able to avoid any complications arising from serum anaphylaxis.

In general medicine and surgery this method is of great use in the treatment of inflammatory disease. In eye disease in particular this speed of acquiring immunity is of enormous value, for an eye can be disorganised completely in a few days by acute inflammation.

The following three cases shew the rapidity of recovery under the influence of such sensitised vaccines. They are particularly interesting, in that two of them anti-sera and ordinary vaccines were first employed with no apparent result.

Case 1.—B. F., girl, aged 11, had a lamellar cataract.

23 April, 1912. The lens of the right eye was "needled."

27 April. A corneal section was made and the greater part of the lens matter was washed out with a stream of normal saline. This was followed by much reaction and an acute iritis set in.

8 May. On this date it was obvious that a low form of intra-ocular suppuration had begun. As this type of inflammation is most frequently caused by a staphylococcus, 12½ million of a stock staphylococcus vaccine was injected. This, however, had no influence on the course of the disease, and the eye gradually became worse.

11 May. Eye worse. Pupil filled with lymph. The wound was opened and cultures and smears were made from the aqueous and lymph. The anterior chamber was irrigated with dilute hydrogen peroxide (1 volume).

12 May. A coliform organism, identified later as Bacillus Fæcalis Alkaligenes, grew in pure culture in all the tubes. The patient was therefore given 25 cc. of an anti-colon bacillus serum into the abdominal wall.

13 May. The eye was still acutely congested.

14 May. A further 25 cc. of the serum and ½ million autogenous vaccine given. Eye the same.

16 May. 1 million vaccine given. Eye same.

18 May. 2 million vaccine given. Eye same.

19 May. 25 million sensitised vaccine given. Eye same.

20 May. 50 million sensitised vaccine given. Eye a little better.

22 May. The eye better. The iris is returning to its normal colour, the sclerotic less injected.

27 May. 100 million sensitised vaccine given. The sclerotic is much less injected.

28 May. Sclerotic nearly free from congestion.

29 May. The sclerotic was no longer injected. The inflammation had completely subsided.

Case 2.—C. S., 44, male, had a lamellar cataract.

30 April, 1912. Through a corneal section the lens capsule was lacerated and most of the lens matter washed out with a stream of saline.

1 May. The tension of the eye rapidly rose and the wound was therefore opened and more lens matter washed out. The eye reacted violently and an acute iritis set in.

8 May. On this date it was obvious that a low form of intra-ocular suppuration had begun. 25 million stock staphylococcus vaccine was given, but no improvement followed.

12 May. On the assumption that the organism that was the cause of the trouble in this eye was the same as that isolated from case 1, 20 cc. of anti-colon bacillus serum was injected into the flank.

13 May. No alteration in the condition of the eye, which was still greatly injected.

14 May. 2 million vaccine from case 1 given.

16 May. Eye same. 20 cc. serum and 4 million vaccine given.

18 May. Eye about the same, sclera still acutely injected. 8 million vaccine given.

19 May. 25 million sensitised vaccine given. Eye same.

20 May. 50 million sensitised vaccine given. Eye same.

21 May. Eye better.

22 May. Eye much better. Sclerotic nearly free from congestion in places.

24 May. Eye better.

27 May. 100 million sensitised vaccine given. Eye better.

31 May. Eye nearly free from congestion. Patient made a complete recovery.

Case 3.—A. D., 35, male, had had a lamellar cataract, which was washed out in a manner similar to that employed in Case 2 on 2 April. The operation was followed by much reaction and iritis, so that the pupil was nearly occluded. The eye remained red and irritable.

23 April, 1912. The eye had recovered sufficiently to allow of an operation for capsulotomy. The eye reacted greatly to this and remained red in spite of every treatment.

19 May. Having Cases 1 and 2 in mind, it was thought that this patient might have become infected with the same organism. Dr. W. T. Hillier kindly examined this patient's blood for me and found that it was capable of agglutinating the organism in question in a dilution of 1 in 2,000 in an hour. The patient was therefore given 25 million of the sentitised vaccine.

20 May. 50 million sensitised vaccine given.

21 May. 100 million sensitised vaccine given.

22 May. 200 million sensitised vaccine given. The eye rapidly quietened down and the patient was discharged cured.

The source of the infection was never definitely determined, and I was therefore unfortunately unable to isolate an organism from it and shew its identity with that recovered from Case 1. Further, there is no experimental proof that the organism that had infected Case 2 was the same that had infected Case 1. Suppuration rarely occurs in modern ophthalmic surgery, and it therefore seemed highly probable that the same cause was acting in both cases. The results of the vaccination shew that the assumption was justified.

In Case 3 it was highly probable that the infecting organism was identical, for an agglutination of 1 in 2,000 is a rare event except in the case of patients who have been immunised against an organism.

I wish to thank my father, Mr. William Lang, for permission to publish these cases.

ON THE AFTER HISTORIES OF PATIENTS ON WHOM THE OPERATION OF GASTRO-JEJUNOSTOMY HAS BEEN PERFORMED FOR NON-MALIGNANT DISEASE.

By C. H. S. WEBB, M.S., F.R.C.S.,
SURGICAL REGISTRAR TO THE MIDDLESEX HOSPITAL.

In the twenty-first volume of these "Archives" there appeared a paper by Dr. Otto May entitled "The After Histories of Patients on whom the operation of Gastro-enterostomy had been performed for non-malignant disease," in which the author had attempted to trace those cases upon whom the operation had been performed during the years 1906, 1907, and 1908.

Realizing the importance and great interest of such an investigation, I determined that, during my tenure of office as Surgical Registrar, I would take the next three years (1909, 1910 and 1911) and so complete a series of these cases for six years.

In order that my results should compare as closely as possible with those of Dr. Otto May, I have based the present investigation as far as possible on the same lines as were followed in the above-mentioned paper by him.

During the years 1909 to 1911, 86 patients were discharged after the performance of this operation. To each of these was sent a letter asking for a personal interview; and in case this should be impossible, a form of printed questions was included for the patient to fill up and return to me. The questions were arranged as follows:—

1. Have you had any return of your old trouble?
2. Are you able to do your ordinary work?
3. Are you gaining or losing weight?
4. Have you any pain; if so, when? where?
5. Do you vomit now at all?
6. Have you brought up blood since the operation?

7. Is the appetite good or bad?
8. What can you eat, and what are you unable to eat?
9. Any details you would like us to know.

Twenty-five patients came up to hospital and were seen and examined; 16 patients returned the form filled up; 5 patients had died since the operation; while 40 were not traced.

Following Dr. May's method I have classified the results of the operation into four groups:—

A. Result entirely satisfactory.
B. Considerable improvement (not, however, perfect health).
C. Slight improvement.
D. No improvement. (Some cases in this group have stated that they were worse.)

I here quote from Dr. May's explanation of his classification:

"This is naturally a rough and ready method, and probably no two observers would obtain exactly the same figures from the material in question. I have tried, however, to keep entirely free from bias, and judge each case fairly on its merits. In coming to a conclusion I have been guided largely by the effect on the general well-being of the patients, on their capacity for work and the enjoyment of the ordinary amenities of life. Thus, the patients in Class A comprise those who can do their ordinary work without discomfort, provided they exercise ordinary care and discretion in their dietary and habits. Class B includes those whose routine is liable to interruption by occasional attacks of pain or vomiting, in spite of ordinary care. In the third class (C) are the patients in whom the stomach still claims a large share of their attention—sufficient to interfere seriously with their capacity for work, while Class D contains those unfortunate victims in whom the epigastrium remains the centre of their kosmos."

In addition to obtaining a history since the operation from those patients who presented themselves for a personal interview, I took the opportunity, in conjunction with Mr. W. N. Kingsbury, Assistant Radiologist to the Hospital, of making an X-ray examination of the stomach with a bismuth meal.

(The results of this investigation are published in another paper in the present volume of these "Archives.")

The results of the present investigation are set out below in tabular form. One or two of the cases have been operated on since the performance of their gastro-jejunostomy, and, where possible, an account of such operation has been included in the table; and, if possible, an account of the state of the stomach and anastomosis.

The investigation was commenced in January 1914, and finished in May 1914, so that the time that has elapsed since the operation can be approximately seen.

The number of cases that could not, or would not, be traced forms unfortunately rather a large percentage. Many of the letters came back *through the Dead Letter Office*, but many did not, and one can only conclude that those patients were unwilling either from ingratitude or laziness to respond to the request.

TABLE I.

Number.	Sex.	Age.	Duration.	History before Operation.	Findings at Operation.	Nature of Operation.	History since Operation.	Result.
	1909							
1	F.	48	Several years.	Pain 2 hours after food. Vomiting and hæmatemesis. Marked dysmenorrhœa.	Omental adhesions. Ulcer on lesser curvature near pylorus.	P. G. J.	Quite well for 4 years after operation, but for last 15 months pain after food (1 hr. p.c.). Vomiting at hæmatemesis. Does ordinary work. Lost weight lately. Anorexia. Fats and pastry upset her. Constipated. Bad teeth. This patient was operated on in April 1914 after the above were recorded, and a band of omentum was found constricting the stomach, distal to the gastrojejunostomy opening. The tip of the band was adherent to the site of the old ulcer, which seemed as though again subacutely active. Both pylorus and gestrojej. opening quite patent. The jejunum at site of G. J. was somewhat dilated. The band was divided only.	C.
2	F.	27	2 years.	Pain, vomiting, and hæmatemesis. Pain 10 minutes after food.	No ulcer found.	P. G. J.	Has done no work since operation. As soon as she begins work falls ill. Can't eat meat, fats, pastry, or cakes. Vegetables give her the wind. Constipated. Had all teeth out in Feb. 1913; no better. Appendectomy in 1910; no better. Was a little better for 6 months after operation, but has gone down since. Patient is small and thin. Not pale. Has had a lot of pain. Some melæna (?) No hæmatemesis. Pain wakes her up at night.	D.
3	F.	36	Several years.	Feb. 1900 "an operation on left kidney and ovary," and later on right "kidney and ovary" (May 1900). Oct. 1900 "an operation on right ovary." Headache, vomiting, and pain, 1 hour after food.	No mention of state of stomach.	P. G. J.	Better up to second year after operation. Worse last six months. Can only do light work. Tires easily. Vomits one week in six. No hæmatemesis (N.B.—no hæmat. before operation). Anorexia. Eats light food only. Can't eat beef, fats, or pastry. "Least bit of fat makes me vomit." "Not very constipated." Pyorrhœa. "Not much wrong, but still not quite well."	C.

Note.—P. G. J. = Posterior Gastrojejunostomy.

Number.	Sex.	Age.	Duration.	History before Operation.	Findings at Operation.	Nature of Operation.	History since Operation.	Result.
4	F.	65	6 months.	Pain; no relation to food. Constant vomiting. Hæmatemesis; no melæna.	Hard thickened pylorus. Dilated stomach.	Pylorectomy and P. G. J.	No return of pain. Able to work. About same weight. No pain, vomiting, or hæmatemesis. Can eat almost anything. Appetite fairly good. Not constipated.	A.
5	F.	26	13 years.	Pain, vomiting, and hæmatemesis. Jan. 1908 postr. gastrojejunostomy. Pain recurred. No hæmatemesis. Pain now (1909) continuous, no relation to food. Vomits occasionally.	Omental adhesions. Pylorus nearly closed. G. J. admitted a thumb (through gastrotomy). Great difficulty c. anæsthetic.	Nothing further done.	Had return of pain in 1913 and vomiting. Had teeth extracted and got better. Able to do ordinary work. About same weight. Has pain if takes a large meal, otherwise none. No vomiting or hæmatemesis (*vide supra*). Appetite since 1913 good. Can't eat eggs, bacon, fats. Better for operation.	B.
6	F.	24	?	Had an anterior gastrojejunostomy performed 2 years ago. Still has pain, vomiting, and hæmatemesis.	Anterior G. J. opening nearly closed. Pylorus patent.	P. G. J.	No pain or vomiting since operation, and put on weight till 3 months ago, when pain and vomiting returned. One month ago hæmatemesis. Under medical treatment (Bi c. Soda). Has since got better.	B.
7	M.	42	12 years.	Pain, vomiting. No hæmatemesis.	Pylorus thickened.	P. G. J.	No return of old trouble. Able to do ordinary work. Losing weight slowly. No pain, vomiting, or hæmatemesis. Appetite bad. Teeth bad. Eats anything except pies or pastry. Occasional fits of depression.	B.
8	M.	36	8 years.	Pain only; comes on soon after food; relieved by lying in prone position.	Firm hard pylorus. Many adhesions.	P. G. J.	No return of old trouble. Able to do ordinary work. Gaining weight. No pain, vomiting, or hæmatemesis. Appetite good. Can eat any good plain food. Slight ventral hernia opposite umbilicus. Apparently very well indeed.	A.

9	F.	62	1 year.	Losing weight. Pain 2 hours after food.	Thickening at pylorus. Not thought to be malignant at operation. Some dilatation of stomach.	P. G. J.	Has been quite well ever since. No pain or vomiting. Can eat anything. Appetite good. Fat and looks well. Slightly constipated; occasional aperients.	A.
10	F.	35	12 years.	Pain, vomiting, and hæmatemesis. Pain relieved by vomiting. Medically treated in 1906 and 1908. Pain worse since then. Milk diet only. Vomits now very frequently.	No mention of state of stomach. At second operation (April '09) mention is made of an "old scar" (?) in stomach or parietes.	Jan. 9, '09, P. G. J. Jan. 16 anastomosis "En Y;" better till March when hæmatemesis. April, laparotomy for adhesions of omentum to parietes and old scar.	Has just been discharged from London Hospital after another operation. Continued pain and vomiting since last operation at Middlesex.	D.
11	F.	46	?	Irregular vomiting. No relation to food. Little pain. No hæmatemesis.	A few adhesions between pylorus and gall-bladder.	P. G. J.	No return of old trouble. Able to do ordinary work. Gaining weight. No pain, vomiting, or hæmatemesis. Appetite very good. Can eat anything except soup. Acting as Matron in a Home—hard work. Did not get quite well for 2 years after operation.	A.
12	M.	35	2 years.	Pain after food. No relation to food. No vomiting. ? Melæna.	Hard pancreas. ? ulcer of stomach.	P. G. J.	Has been well for last 12 months (was under treatment on and off till then). Able to do ordinary work. Not gaining or losing weight. No pain, vomiting, or hæmatemesis. Appetite good. Much better for operation. No restriction with regard to diet.	A.

Number.	Sex.	Age.	Duration.	History before Operation.	Findings at Operation.	Nature of Operation.	History since Operation.	Result.
13	M.	?	5 years.	Pain 2 hours after food. Melæna. Hæmatemesis.	Old ulcer at pylorus.	P. G. J.	Occasional return of pain, especially after too full a meal. Has gained weight slightly. No vomiting or hæmatemesis. Appetite good. Can eat ordinary food. Occasionally has to diet himself.	B.
14	M.	36	5 years.	Pain 2 hours after food. Relieved by food. Vomiting and hæmatemesis. Melæna.	Duodenal ulcer.	P. G. J.	No return of pain, vomiting, or hæmatemesis. Able to do ordinary work. Appetite good. Can eat anything. "Operation in every way satisfactory."	A.
	19	10						
15	F.	39	11 years.	Pain after food. Vomiting and hæmatemesis.	Healed pyloric ulcer. Active ulcer on lesser curvature.	P. G. J.	Has never been free from trouble. Does light house-work only. Occasionally can't do any. Pain 1 to 1½ hours after food., in "stomach and left side." Vomits if not careful what she takes. Hæmatemesis 6 months after operation. Appetite very bad. Only wants fluids. Lives chiefly on plain boiled fish, milk, Panopepton, Benger's Food, and Ovaltine. "Life is a perfect misery."	D.
16	F.	42	10 years.	Pain after food. Hæmatemesis 4 years ago. Seldom vomits.	No sign of any ulcer.	P. G. J.	No return of old trouble. Does her ordinary work well. Gaining weight. No pain, vomiting, or hæmatemesis. Appetite very good. Can eat almost everything except fish. Had to study her diet for 2 years.	A.
17	M.	24	6 months.	Pain 2 hours after food. No vomiting or hæmatemesis. Melæna.	Duodenal ulcer.	P. G. J.	Has been quite well ever since. Doing ordinary work. No pain, vomiting, or hæmatemesis.	A.
18	F.	19	6 months.	Epigastric pain after food. No vomiting or hæmatemesis. Last night, acute perforation.	Perforation of ulcer posterior wall of stomach—into lesser sac.	Ulcer sutured and P. G. J.	No return of old trouble. Able to do ordinary work. Gaining weight. No pain, vomiting, or hæmatemesis. Appetite very good. Can eat anything except pork. Has never been so well in all her life. Has married since operation.	A.

19	M.	47	?	Pain 2—3 hours after food. Vomiting, "Hunger pain," relieved by food, succeeded by typical pain after food.	Ulcer, 1st part of duodenum.	P. G. J.	No return of old trouble to the same extent. Can not quite do ordinary work. Soon gets tired. Losing weight. Slight pain in epigastrium. No vomiting. No hæmatemesis. Appetite only fairly good. Can't eat beef or pork.	B.
20	M.	40	6 years.	Pain, heartburn; no relation to food. No vomiting or hæmatemesis.	Chronic ulcer of pylorus; contraction. Dilatation of stomach.	P. G. J.	Very much better for 6 months after operation, but now has a good deal of "stomach trouble," in fact more severe pain than before operation.	D.
21	M.	29	18 years.	18 years ago swallowed $CuSo_4$, since then has had "indigestion" till 4 years ago, when had definite pain and vomiting, culminating in perforation, which was sutured. Since the perforation (3 weeks ago) has had hæmatemesis.	Old (perforated) gastric ulcer.	P. G. J.	Has been better than for 20 years before operation (gastrojej.) Hæmatemesis once 2 months ago. Vomited 3 times in 3 years. No pain.	A.
22	M.	48	20 years.	Pain 2½ hours after food, occasionally relieved by food. Vomiting relieved pain. ? hæmatemesis.	Complete (?) stenosis of pylorus due to cicatrized ulcer. Quite definite.	P. G. J.	On the whole has kept wonderfully well. Able to do work with more pleasure than for a number of years before operation. Weight increased from 10 to 13 stone. No pain. Vomited once or twice. No hæmatemesis. Appetite very good. Can eat any light food. Can't eat pork, steak, pastry, or Brussels sprouts.	A.
23	M.	59	12 years.	Pain after food. No vomiting or hæmatemesis.	Stomach dilated. Mass at pylorus. ? growth (1911).	P. G. J.	No pain. No sickness. Can do his work quite well. Appetite good. Still has to diet himself strictly. Very pale and thin, especially in face. On the whole better than before operation.	B.
24	M.	22	10 months.	Pain and vomiting after food. No hæmatemesis. ? Melæna.	Slight thickening of pylorus, which was, however, patent.	P. G. J.	Vomited once or twice Eructations. Better than before operation, but still not quite well. Can do his work fairly well. Abdomen atonic.	B.

Number.	Sex.	Age.	Duration.	History before Operation.	Findings at Operation.	Nature of Operation.	History since Operation.	Result.
25	M.	34	3 weeks.	Pain 10 minutes to 1 hour p. c. No vomiting or hæmatemesis. ? Melæna.	Pylorus stenosed (duodenal ulcer diagnosed but not mentioned as seen at operation).	P. G. J.	Sick once a month. Can't take a heavy meal. Dull continuous ache over appendix. Never was sick before operation. Constipated. Has never been well since operation.	C.
26	M.	34	14 months.	Pain; worse at night, relieved by food. Vomiting and hæmatemesis.	Mass at pylorus, thought to be inflammatory. Adherent to liver.	P. G. J.	Has not had a day's illness since operation. No sickness or pain. Bowels now regular, were irregular.	A.
27	M.	26	5 weeks.	Pain after food. Only vomited once, when accompanied by hæmatemesis. Some melæna.	Ulcer 2nd part of duodenum.	P. G. J.	Six months after operation same symptoms (pain, vomiting, melæna, no hæmatemesis). Is now quite well, save for anorexia. Once or twice has been sick after breakfast. Can eat fats.	A.
28	F.	42	A few weeks.	Pain after food, and vomiting. No hæmatemesis.	Thickening of pylorus.	P. G. J.	Has been much better. No pain. Put on weight. Can eat anything.	A.
29	F.	45	6 years.	Pain 1 hour after food. Vomiting. No hæmatemesis or melæna.	Pyloric stenosis; old ulcer. ? Active new ulcer on greater curvature.	P. G. J.	Was free for 6 months from pain or trouble. Since then symptoms have recurred. Vomits every few days. No hæmatemesis. Not so much pain as before operation. Some diarrhœa. Eats meat, vegetables, fish, eggs. Can't eat fats or pastries.	C.
30	M.	58	4 years.	Pain immediately after food. Vomiting and hæmatemesis. Had some abdominal operation 4 years ago. Since then better till 4 months ago, when symptoms as above.	Perigastric adhesions. No mention in notes of state of stomach or nature of previous operation.	P. G. J.	Has had no pain at all since operation. Says he feels marvellously well. Eats anything.	A.

31	M.	?	6 weeks.	Pain, vomiting, and hæmatemesis. Last night acute perforation.	Perforation ulcer anterior wall, near pylorus.	P. G. J. and drainage.	"Very much better. No pain or vomiting. Has put on weight. Can eat anything."	A.
32	F.	43	18 years.	"Indigestion" symptoms. Last night acute perforation.	Perforation lesser curvature; large ulcer.	P. G. J. and drainage.	Still has a lot of pain. No vomiting. "No sleep at night." "Can eat anything." Can work better than before operation. Is constipated and has lost weight. "Has had a lot of worry."	C.
	1911							
33	F.	26	4 years.	Pain 1 hour after food. Vomiting and hæmatemesis.	Nothing in stomach, ? slightly dilated. Adhesions round pylorus and first part of duodenum.	P. G. J.	Attacks of vomiting for 18 months after operation. Still has some sickness. Can do ordinary work. Still has some pain after food in epigastrium. No hæmatemesis. Appetite bad. Eats mutton and light food. Not pastry, fats, cheese, vinegar.	C.
34	F.	40	?	Pain after food, and vomiting. No hæmatemesis.	Pyloric stenosis . . . . Developed a hernia of jejunum through transverse mesocolon, for which	P. G. J., (and later) jejuno-jejunostomy.	No return of old trouble. Able to do ordinary work. No pain, vomiting, or hæmatemesis. Appetite "normal." Can eat any light ordinary food. "I consider that I have derived great benefit from the operation."	A.
35	M.	27	6 years.	Pain 2 hours after food. No vomiting or hæmatemesis. Melæna.	Duodenal ulcer.	P. G. J. Rather brisk hæmatemesis and melæna after operation.	No return of old trouble. Able to do ordinary work. No pain, vomiting, or hæmatemesis. Appetite medium. Can eat anything except cucumber and radishes.	A.
36	M.	42	6 months.	Pain after food. Vomiting. No hæmatemesis.	Ulcer 1st part of duodenum.	P. G. J.	No trouble since operation; occasional "heartburn." Able to do ordinary work. Gained 4 lbs. Rich fatty foods make him feel sick. No hæmatemesis. Appetite good. No vomiting. Much better since operation. Bowels act more regularly since operation. Some pyorrhœa.	A.

Number.	Sex.	Age.	Duration.	History before Operation.	Findings at Operation.	Nature of Operation.	History since Operation.	Result.
37	F.	48	3 months.	Pain, vomiting, and hæmatemesis. Pain after food, relieved by vomiting.	Hour-glass stomach, the opening admitting tip of little finger.	Anterior gastro-jejunostomy.	No return of old trouble. Able to do ordinary work. Gaining weight. No pain, vomiting, or hæmatemesis. Appetite very good. Can eat anything, in small quantities. Much better for operation.	A.
38	F.	24	?	Admitted for acute perforation, occurring the night before admission. No previous history.	Acute perforation of pyloric ulcer.	P. G. J.	No return of old trouble. Able to do ordinary work (shorter hours). A little pain occasionally. No vomiting or hæmatemesis. Appetite fairly good. Can eat nearly anything, except cheese, potatoes, and fats. Very much better for operation.	B.
39	F.	40	1 year.	Pain after food. Vomiting. ? Hæmatemesis. Chronic uterine trouble for which pessary for many years.	Pyloric ulcer.	P. G. J.	No severe pain as before operation, but "considerable flatulence." Can only do light work. Weight varies. Some pain at site of operation, "wind gets round her heart." Sick once since operation. No hæmatemesis. Appetite fairly good. Eats light food. Milk food suits her best. Though usually fairly well, has occasional "reminders."	C.
40	M.	35	5 months.	Pain after food. No vomiting or hæmatemesis. Not constipated. Had appendix removed in 1910.	Stomach slightly constricted in the middle (? spasmodic). ? Ulcer of lesser curvature. Pancreas hard.	P. G. J.	No return of old trouble. Able to do ordinary work. Gaining weight. No pain, vomiting, or hæmatemesis. Appetite very good. Can eat anything. Has not felt so well for years.	A.
41	M.	35	6 years.	Pain after food. No vomiting or hæmatemesis.	"Stenosis" of pylorus.	P. G. J.	Has had two or three "relapses." Able to do ordinary work, except for above relapses. No pain or vomiting except during "relapses." No hæmatemesis. Appetite good. Has to keep to light food. Since operation has been constipated, always requiring purgatives to obtain an action of the bowels.	B.

TABLE II.

	A	B	C	D	
MALES	13	6	1	1	21
FEMALES	8	3	6	3	20

TABLE III.

	MALES.				FEMALES.			
	A	B	C	D	A	B	C	D
Thickening of pylorus c' dilatation of stomach	3	4	1*	1	4†	—	—	—
Ulcer (active) of pylorus or lesser curvature	2	1	—	—	—	—	1	—
Healed pyloric ulcer and active new ulcer proximal to pylorus	—	—	—	—	—	—	1	1
Duodenal ulcer	5	1	—	—	—	—	—	—
Acute perforation gastric ulcer	1	—	—	—	1	1	1	—
Hour-glass stomach (anterior method)	—	—	—	—	1	—	—	—
For closed anterior gastro-jejunostomy	—	—	—	—	—	1	—	—
Perigastric adhesions	1	—	—	—	1	1	2	1
Hard pancreas. ? Ulcer in stomach	1	—	—	—	—	—	—	—
"No ulcer found"	—	—	—	—	1	—	—	1
No mention of state of stomach	—	—	—	—	—	—	1	—
	13	6	1	1	8	3	6	3
	19		2		11		9	

* Appendix.

† One pylorectomy among these four.

A statement of the results in tabular form appears in Table II., a perusal of which shews a marked sex difference in the percentage of cures (13 males to 8 females), or 61·9 per cent. for males against 40 per cent. females. While if the columns A and B are added together, 19 males out of 21 were cured or greatly benefited as against 11 females out of 20, or 90·5 per cent. males to 55 per cent. females.

Only one male was definitely worse and only two were found in the last two columns (C and D), while 3 females were definitely worse and 9 were found in the last two columns.

This gives 4·8 per cent. males worse, or for the last two columns 9·6 per cent., against 15 per cent. females worse or 45 per cent. obtained by adding together columns C and D.

It is again rather striking that seven out of the eight females in Class A were over 40, and two of these were over 60, while all the women in Class D were under 40.

In Table III. will be found in tabular form the various conditions found at operation for which the gastrojejunostomy was performed, with the results appended.

Several points emerge on examining the latter. One is that no case of simple atonic stomach appears in the list. Secondly, that by far the best results have been obtained in cases of duodenal ulcer. Six males with duodenal ulcer were operated upon, and five of these, or 83·3 per cent., were definitely cured, while the other was much improved, or taking the two classes A and B together, 100 per cent.

In the cases of thickened pylorus with dilatation of the stomach 33·3 per cent. males were definitely cured and 77·7 per cent. cured or much improved, while 22·2 per cent. were not improved or worse. Of these cases that were not improved, one now has definite pain and tenderness to deep palpation over the appendix, and it is possible that a gastrojejunostomy was performed in this case for an appendicular gastralgia.

Of the females operated on for the same condition 100 per cent. were cured, and this series includes one case of pylorectomy with closure of stomach and duodenum and posterior gastrojejunostomy in a woman of 65. The condition was not malignant.

Case No. 1 is interesting because the reason why the case derived no benefit from the operation was shewn at a later operation (1914) to be due to the presence of an adhesion of a fingerlike process of great omentum to the site of the old ulcer at the lesser curvature. This omental adhesion had become drawn out, rounded and cord-like, and was constricting the stomach just distal to the gastrojejunostomy opening, so that although the gastrojejunostomy opening was working well, nothing at all was apparently entering the pyloric antrum of the stomach or passing through the pylorus.

Case 3 is probably an example of a patient with the "lust for operation," upon whom every surgeon is unwilling to operate unless practically obliged to do so. This patient had had various kidneys and ovaries operated upon without deriving any marked benefit, and the gastrojejunostomy that came last on her list did no good either.

Case 6 is an example of the failure of an anterior gastrojejunostomy to relieve the symptoms for which it was performed. The posterior method, which was employed in 1909, although it has relieved has not entirely cured.

Case 10 is another example of a surgical failure. The duration of symptoms before operation was twelve years, during which time she had several times been an in-patient in the medical wards under treatment for her gastric ulcer without deriving any lasting benefit. At the operation in 1909 no definite note is made as to the condition of the stomach, but one gathers that there was an old scar somewhere! The gastrojejunostomy was performed on Jan. 9, 1907, and on Jan. 16 the abdomen was again opened for persistent vomiting and an anastomosis "en Y" performed. In April, while still in the hospital, another operation was performed for persistence of symptoms and hæmatemesis; adhesions of omentum to parietes and "old scar" were found and broken down.

The symptoms persisted even after this, and at the time of writing she had just been discharged from the London Hospital after another operation without apparently having derived much benefit.

Case 15, although not operated on so many times as the previous case, is yet another example of marked failure of gastrojejunostomy as a therapeutic measure. These two cases make one wonder whether, underlying the gastric condition found, there may not have been some other causal factor to which the surgeon's attention might more profitably have been directed, and whether in some cases gastrojejunostomy may be only a palliative measure, occasionally failing even to palliate.

Case 20 is instructive in that the condition found at operation was one, apparently, fully justifying the operation of gastrojejunostomy. The stomach was dilated behind a contracted pyloric ulcer. For six months after the operation the patient was very well, and then for no apparent reason the symptoms recurred. It is most likely that gastrojejunal ulceration took place and that the gastrojejunostomy opening in consequence cicatrized and possibly closed. This closure of the new stoma, or at any rate the non-passage of stomach contents via the stoma, has been seen in several cases by Mr. Kingsbury and myself when examining these gastrojejunostomies with a bismuth meal and the X-rays. We believe that in certain cases the pylorus may fully recover its function, and that where this obtains the gastrojejunostomy opening becomes functionless.

But apparently there are some cases when the pylorus does not again become functional, and should the gastrojejunostomy opening cicatrize from gastrojejunal ulceration, then the stomach reverts to the original condition for which the operation was performed.

This is a possible explanation for the case cited above (No. 20).

Case 34 is interesting as an example of one of the immediate complications of the operation. A coil of jejunum passed up through the opening in the transverse mesocolon, became nipped, and gave rise to symptoms of obstruction. The abdomen was at once opened and the coil reduced and a jejuno-jejunostomy performed with unqualified success, the patient being now quite well.

Case 35 is an example of another immediate complication after gastrojejunostomy, namely, smart hæmorrhage from the site of the ulcer, in this case situated in the duodenum and evidenced by both hæmatemesis and melæna.

I have seen a brisk hæmatemesis, and even death from hæmorrhage occur after a simple gastrojejunostomy for gastric ulcer, and although it may come from the suture line in most cases, I believe it may also come from the ulcer itself, especially if the site of the ulcer be much handled and pulled about during the examination of the stomach.

Of the five patients who subsequently died, one died of carcinoma of the stomach two years later, the second died soon after the operation from some cause unconnected with the stomach, a third died from influenza four years after the operation, having enjoyed excellent health from the date of operation till his death. The fourth case died of acute perforation of the stomach in the same year as the original gastrojejunostomy; while in the fifth case the cause of death was not ascertained.

I have not attempted to analyse the results of the operation in terms of the predominant symptoms for which it was performed, because the histories embodied in the case papers have shewn such marked differences in quantity and quality as to make an accurate judgment of the value of any given symptom well nigh impossible. But in most cases there has been a more definite statement as to the condition of the stomach or duodenum found at operation, and it has been found possible to classify the results in terms of the actual "morbid anatomy of the living," as seen in Table III.

In conclusion, with Dr. Otto May's acquiescence, I have combined his percentages and my own with the idea of presenting a continuous series of results for six years.

Table IV.

(*Expressed as percentages.*)

		A.	B.	C.	D.
Males	1906—1908	64·7	23·5	5·8	5·8
	1909—1911	61·9	28·5	4·9	4·9
	Combined	63·3	26·0	5·3	5·3
Females.	1906—1908	25·8	16·1	16·1	41·9
	1909—1911	40	15	30	15
	Combined	32·9	15·5	23	28·4

The results in the table of males are strikingly similar, and therefore the combined percentages probably express a still more correct figure; but in the female table there is a striking dissimilarity of results, and in consequence the combined figure may be misleading. However, it is gratifying to note that the percentage of females cured is considerably higher in the later triennium than in the earlier; and similarly the percentage of females found in Class D is sensibly smaller than in the earlier three years.

I believe this to be due in some measure to a more rigid selection of cases for the operation; for instance, the patients suffering from simple atonic dilatation of the stomach are not now operated upon; while where an exploration of the stomach is carried out, no gastrojejunostomy is now done unless on exposing the viscera there be found some condition of the stomach or duodenum, evident to touch or sight, sufficient to justify the anastomosis. Also, probably improvements in technique may have something to do with the improvement in results, though why this should operate only in females is difficult to understand. On the whole one is inclined to believe that whereas formerly gastrojejunostomy was believed to be the panacea for each and every gastric symptom, its use as a therapeutic measure is now based upon a greater experience, certain cases being definitely deemed unsuitable for its employment, and still further, its use is determined, not by symptoms alone, but by signs found at operation, or in others by a wider appreciation of the value of the pathology of the living and a less slavish adherence to a line of treatment conceived and determined upon only by the help of a history and examination by the bedside, at which at best only an inferential opinion may be hazarded as to the presence of an ulcer of the stomach; whereas the laparotomy may reveal the chronically diseased appendix or the thickened gall bladder with its contained stones, or no pathological cause at all may be found to account for the symptoms, an indication that the insult of gastrojejunostomy should not be added to the injury to the parietes.

In conclusion I should like to take this opportunity of expressing my thanks to the Honorary Surgical Staff for their kindness in allowing me to make use of their cases for the purpose of this paper.

AN ENQUIRY INTO THE RADIOGRAPHIC APPEARANCES OF THE STOMACH AFTER GASTRO-JEJUNOSTOMY.

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In the following paper an attempt has been made to note the radiographic appearances of the stomach after the performance of the operation of gastro-jejunostomy for non-malignant disease.

The cases examined form part of the material of another paper published in this number of the "Archives" by one of us.* The operations were performed either in 1909, 1910 or 1911. This series of examinations was carried out during the first four months of 1914, giving a maximum of five and a minimum of two years after operation.

The objects of the investigation were to discover as far as possible what changes, if any, had occurred at the new stoma, and to obtain some idea of what proportion of food escaped through the pylorus and what through the gastro-jejunostomy opening.

The clinical history since the operation, or in other words the data necessary for classifying the result of the operation and the radiographic appearances, were investigated separately and by two different persons, while the pathological state of the stomach at the operation, as noted in the case papers of the patient, were not known at the time to either observer.

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* "On the After Histories of patients on whom the Operation of Gastro-Jejunostomy has been performed for Non-Malignant Disease." Webb.

Eighty-six patients operated upon during the years 1909, 1910 and 1911 were written to with a request for a personal interview. Of this number only twenty-five presented themselves. Of these the great majority were following their ordinary occupation, and got away from their work only with difficulty. We were thus unable to watch the stomach discharge the whole of the bismuth meal given, and the process could not be timed in every case.

The technique of the X-ray examination may be described very briefly under two headings.

(i.) Preparation of the bismuth meal.

(ii.) Examination of the shadow on the screen.

Three quarters of a pint of bread and milk was the quantity used. The bread was practically pounded up so that a uniform paste was obtained. Into this three ounces of bismuth carbonate were well stirred so that a fairly thick cream-like mass resulted. A similar meal was given to each patient, and we were able to induce each patient to swallow the whole of the mixture.

The presence or absence of any pathological condition of the œsophagus was looked for in the usual way. Two or three mouthfuls of the mixture were watched passing down the œsophagus into the stomach. In every case this passage was normal, no obstruction being noted. The patient then finished swallowing the bismuth mixture, and as soon as the whole meal had been eaten he was again placed in the orthodiascope and the shadow cast on screen by the bismuth examined.

The greater number of patients were re-examined after an interval of about half an hour, and a few again after a further time had elapsed.

In Table I. we have briefly noted the condition described as obtaining at operation and the appearances on the fluorescent screen. The results, *i.e.* into which class, A, B, C or D, each patient shall be put, are based entirely on their histories since operation. The classification of the clinical results is explained in the previous papers in these Archives.

Explanation of Abbreviations.

All bismuth through pylorus represented by P + + +, G J O.

Greater part bismuth through pylorus, some through gastro-enterostomy, P + +, G J +.

Greater part through gastro-jejunostomy, some through pylorus, P +, G J + +.

All through gastro-jejunostomy P O, J + + +.

TABLE I.

Number in present Series.	Number in previous Paper.	Sex.	Age.	Year of Operation.	Condition described as Staining at Operation.	Appearances noted on Screen.	Class.	Remarks.
1	1	F.	48	1909	Omental adhesions. Ulcer in lesser curvature.	Hour-glass stomach. No bismuth seen through pylorus. P. O. Gastro-jejunostomy. acting G J + + +. Constriction was distal to gastro-jejunostomy opening.	C	This patient was operated upon in 1914; an omental band was found constricting stomach at site of old ulcer.
2	2	F.	27	1909	No ulcer found.	Stomach was empty in 20 minutes. Bismuth all went through gastro-jejunostomy opening, and none went through pylorus. G J + + +.	D	
3	3	F.	36	1909	No mention of state of stomach.	Pylorus and gastro-jejunostomy are both patent. Pylorus +. G J + +. The bismuth first went through G J opening. It then appeared to travel up the duodenum. When duodenum was full it passed down jejunum. At this stage pylorus was seen to allow some bismuth to pass through. About half the total quantity of bismuth appeared to be out of stomach in 45 minutes.	C	
4	4	F.	65	1909	Hard, thickened pylorus and dilated stomach. Pylorectomy and posterior gastro-jejunostomy were done.	Gastro-jejunostomy opening is acting well. Peristalsis fairly active. Stomach tubular in shape, lowest part about 1½ inches below umbilicus. G J + + +.	A	
5	5	F.	26	1909	Omental adhesions. Pylorus nearly closed. G J opening admitted thumb. These observations were made through gastrotomy wound. Nothing further was done owing to difficulty with anæsthetic.	Pylorus not acting. G J open. Hour-glass contraction above G J opening. Bismuth was all out of stomach in 20 minutes. Lower border of stomach 2 inches below umbilicus. G J + + +.	B	Original operation in 1908; in 1909 was operated on again for recurrence of symptoms.

6	6	F.	24	1909	Anterior G J nearly closed. Pylorus patent. Posterior G J performed.	Pylorus + +. G J +. Peristalsis active. Lower border of stomach level with umbilicus.	B	There is no note as to why the anterior G J was done.
7	7	M.	42	1909	Pylorus thickened (apparently pyloric obstruction).	Pylorus + +. G J +. Peristalsis active, and stomach appeared to have discharged about half its contents in 20 minutes. Lower border on level with umbilicus.	B	
8	8	M.	36	1909	Firm hard pylorus, with many adhesions.	Pylorus +. G J + +. Lower border on level with umbilicus.	A	
9	9	F.	62	1909	Thickening at pylorus not thought to be malignant. Some dilatation with pyloric obstruction.	P + +. G J +. Pylorus acting well. Shadow corresponding to G J opening was about size of lead pencil. Lower border of typical J-shaped stomach ½ inch below umbilicus.	A	
10	21	M.	29	1910	Old perforated gastric ulcer.	Pylorus and G J both acting. P +. G J + +. Food passed through G J opening before it went through pylorus.	A	
11	22	M.	48	1910	Complete (?) stenosis pylorus. Cicatrization about old ulcer.	Pylorus acting well. G J apparently not acting. P + + +. Stomach appeared hypertonic, lower border 1½ inches above umbilicus. Peristalsis active. Practically empty in 1½ hours.	A	
12	23	M.	59	1910	Mass at pylorus. ? Growth. Stomach dilated.	Pylorus apparently closed. G J acting well. P O G J + + +.	B	
13	24	M.	22	1910	Slight thickening of pylorus, which was patent.	Pylorus acting well. P + +. G J acting. G J +. Peristalsis slow.	B	
14	25	M.	34	1910	Pylorus stenosed. Duodenal ulcer diagnosed, but mention of it at operation.	Pylorus acting. G J not acting. P + + +. G J O. 1 hour after meal most of bismuth was in small intestine; very little in stomach; none was seen passing through G J opening.	C	This patient now has well-defined pain over appendix.
15	26	M.	34	1910	Mass at pylorus, thought to be inflammatory, adherent to liver.	Pylorus acting well. P + + +. S J not acting. G J O. Peristalsis normal.	A	
16	27	M.	26	1910	Ulcer second part of duodenum.	Pylorus acting. P + + +. G J not acting. G J o. Peristalsis slow.	A	
17	28	F.	42	1910	Thickening at pylorus.	Pylorus acting. P + + +. G J not seen acting. G J o.	A	

Number in present Series.	Number in previous Paper.	Sex.	Age.	Year of Operation.	Condition described as Staining at Operation.	Appearances noted on Screen.	Class.	Remarks.
18	29	F.	45	1910	Pyloric stenosis; old ulcer. ? New ulcer at greater curvature.	Pylorus apparently closed. P o. G J acting. G J + + +.	C	
19	30	M.	58	1910	Perigastric adhesions. No mention of state of stomach or nature of previous abdominal operation (operation in 1906).	Pylorus acting. P + +. S J acting. G J +. Stomach empty of bismuth in ½ hour.	A	
20	31	M.	?	1910	Perforated ulcer on anterior near wall pylorus.	Pylorus acting well. P + + +. G J not acting. G J o. Lower border 1½ inches below umbilicus.	A	
21	32	F.	43	1910	Perforated ulcer lesser curvature.	Pylorus apparently shut tight. P o. S J only acting. G J + + +.	C	
22	33	F.	26	1911	Adhesions around pylorus and 1st part duodenum. ? Slight dilatation of stomach.	S J acting well. G J + + +. Pylorus not acting. P o.	C	
23	36	M.	42	1911	Ulcer 1st part duodenum.	Pylorus acting. P + + +. S J not acting. G J o.	A	
24	37	F.	48	1911	Hour-glass stomach. Opening admitted tip of little finger (anterior gastro-jejunostomy).	Pylorus not acting. P o. G J acting well. G J + + +.	A	
25	38	F.	24		Acute perforation ulcer at pylorus.	Pylorus acting well. P + + +. G J not acting. G J o. In horizontal position a small finger-like protrusion was seen. ? Position of G J o.	B	

TABLE II.

Shewing the clinical results in terms of the Radiographic findings.

	X-RAY FINDINGS.	MALES.				FEMALES.			
		A	B	C	D	A	B	C	D
P + + +.	*i.e.*, Pylorus alone seen acting. Gastrojejunostomy not seen acting.	5	—	1	—	1	1	—	—
P + +. G J +.	Greater amount of bismuth seen going through pylorus. Some going through gastrojejunostomy opening.	1	2	—	—	1	1	—	—
P +. G J + +.	Lesser amount through pylorus. Most passing through gastrojejunostomy opening.	2	—	—	—	—	—	1	—
G J + + +.	None seen passing through pylorus. Gastrojejunostomy opening alone acting.	—	1	—	—	2	1	4	1
		8	3	1	—	4	3	5	1

On examining Table II. it will be seen that of the twelve males examined no fewer than eight were very much better for the operation. In five of these eight the food was escaping from the stomach through the pylorus only.

There is one male whose history after operation compels us to put in Class C, yet his pylorus alone is acting, and his case is interesting in that the pain which he still gets after food seems definitely to be related to a diseased appendix.

Where the greater amount of the bismuth meal passed through the pylorus and the lesser amount through the new stoma of three males, one was in Class A and two in Class B.

Of the females whose pylorus alone was acting, Classes A and B only were represented. A similar distribution is also seen in the next group of cases. (P + +. G J +.)

Where the gastro-jejunostomy opening is alone patent we find the clinical history is on the whole worse, *i.e.*, of the females four are in Class C, one in Class D, against two in A and one in B.

TABLE III.

Shewing the X-ray findings and Clinical results in terms of the Pathological findings at Operation.

FINDINGS AT OPERATION.	MALES.				FEMALES.			
	P + + +.	P + +. G J +.	P +. G J + +.	G J + + +.	P + + +.	P + +. G J +.	P +. G J + +.	G J + + +.
Pyloric stenosis with some dilatation of stomach	A C* A	B B	A	B	A	A	—	B C
Ulcer of lesser curvature	—	—	—	—	—	—	—	C
Perforated gastric ulcer	A	—	A	—	B	—	—	C
Duodenal ulcer	A A A	—	—	—	—	—	—	—
Perigastric adhesions	—	A	—	—	—	—	—	C
Hour-glass stomach	—	—	—	—	—	—	—	A
Pylorectomy and gastro-jejunostomy, closure of stomach and duodenum for pyloric "mass" (ulcer)	—	—	—	—	—	—	—	A
Closed anterior jejunostomy	—	—	—	—	—	B	—	—
No ulcer found. Stomach apparently normal	—	—	—	—	—	—	—	D, No. 2 in TABLE I.
No mention of state of stomach	—	—	—	—	—	—	C	—

This group is represented by only one male, who appears in Class B.

Of the two cases in A one was a case of pylorectomy for ulcer of pylorus in a woman of sixty-five years, with the excellent result seen.

When we analyse the results in terms of the pathological condition present at operation (Table III.) a rather striking fact makes its appearance.

Out of 12 cases of pyloric stenosis, with some dilatation of stomach at time of operation, in four cases the bismuth left the stomach wholly through the pylorus, none being seen to pass through the gastro-jejunostomy opening. In one of these cases (a male), the notes state that complete stenosis was present at operation.

If the cases occurring in columns P + + + and P + + G J + be added together, we get seven in which the pylorus has so far recovered as to allow the greater part of bismuth meal to pass, while none or but little was going through the new stoma.

The cases of duodenal ulcer examined both shewed an open pylorus and an apparently closed gastro-jejunostomy opening.

A rather curious result is seen in the case (6) upon which a posterior gastro-jejunostomy was performed on account of the closure of a previously performed anterior gastro-jejunostomy. The patient did not appear to have derived much benefit from the second operation, and yet we find the greater proportion of bismuth passing out through the pylorus, and that much less was passing through the gastro-jejunostomy opening. Despite the two anastomoses peristaltis was active. One case in which the notes state that no ulcer was found at operation was definitely worse, and it was seen that all the food was leaving the stomach *via* the gastro-jejunostomy opening, while the pylorus was apparently transmitting none. This patient is definitely stated (albeit negatively) to have had no ulcer, and presumably no pyloric cicatrization. Yet there appeared to be a closed pylorus when examined with the diascope. Since her operation she has sought relief from her pain at the hands of other surgeons, one of whom has had all her teeth extracted, while another has removed her appendix. She still has her pain and vomiting.

In conclusion the results may be briefly summarised as follows :—

(i.) Out of twenty-five cases examined, in eight no bismuth was seen passing out of the gastro-jejunostomy opening. All was apparently passing through the pylorus.

(ii.) Of these eight, four were cases of pyloric stenosis which had so far recovered as to allow of the passage of food through a previously diseased pylorus despite the presence of an artificial short circuit.

(iii.) Of eight males who had regained their normal health after the operation, in no less than five or 62·5 per cent. the food was passing out of the stomach wholly through the pylorus.

(iv.) Of the females the best results clinically were seen when the pylorus alone was acting or where the pylorus allowed the greater proportion of food to pass through it.

When the gastro-jejunostomy opening was alone patent, five out of eight females were clinically no better for the operation.

(v.) The patients were asked as to their appetite for fats and carbohydrates, and whether they were able to digest these articles of diet or whether they disagreed.

No conclusive results were obtained. It was hoped that greater tolerance for fats and carbohydrates would be shewn by those patients whose pylorus was patent and *a fortiori* by those whose pylorus alone was acting, than by those patients in whom the stoma was alone patent. Although in the former group, theoretically, greater stimulation of the pancreatic secretion would take place, yet no reliable information concerning this was obtained through the medium of such questions.

Our best thanks are due to the honorary surgical staff for their kindness in allowing us to make use of the notes of their cases, and to Mr. C. R. C. Lyster for his permission to use the hospital X-ray apparatus for the purposes of this enquiry.

THE INVESTIGATION OF CARDIAC IRREGULARITY BY MEANS OF THE POLYGRAPH.

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When a case of irregularity of the heart is investigated by the polygraph, it is customary to take simultaneous tracings from two vessels, the radial artery and the internal jugular vein.

By this means it is possible to record graphically the contractions of the auricles separately from the contractions of the ventricles.

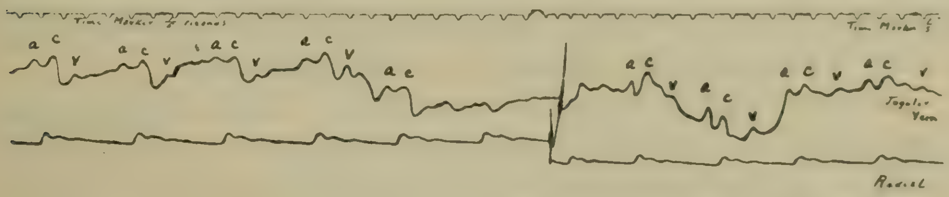

Fig. 1.—Polygraphic record of a healthy subject. The beats of the radial artery are quite regular and, corresponding to each beat, three waves labelled "a," "c" and "v" can be seen in the Jugular tracing.

Before one can interpret the tracings of an irregular heart, one must understand the main characteristics of a normal polygram.

If one studies simultaneous radial and jugular tracings from a normal subject, it is quite obvious that corresponding to each radial upstroke three distinct waves occur in the jugular or venous tracing. These are known as the "a," "c" and "v" waves. The "a" wave represents the contraction of the auricles, the "c" and "v" waves occur during the contraction of the ventricles. (Fig. 1.)

Passing now to cases where the cardiac rhythm is irregular, several different types of irregularity are known to occur. Of these, the more important are the following:—

1. Sinus arrhythmia.
2. Extrasystoles.
    a. From the ventricle.
    b. From the auricle.
3. Paroxysmal tachycardia.
4. Auricular fibrillation.
5. Heart block.

Before describing any of these conditions in detail, it is necessary that one should understand the normal mechanism of the cardiac rhythm.

Normally the impulse is produced rhythmically in a small bundle of highly specialised tissue situated at the junction of the superior vena cava and the right auricular appendix.

This bundle is known as the sino-auricular node, and as the impulse first appears in this bundle, it is usual to regard it as the normal pace-maker of the heart.

From this node the impulse passes along unknown paths through the walls of the auricles to another bundle of highly specialised tissue situated just in front of the opening of the coronary sinus, called the auriculo-ventricular node.

At this point the auriculo-ventricular bundle described by His begins, and it is along this bundle that the impulse travels to reach the two ventricles.

If for any reason the impulse commences at some point other than the normal pace-maker, or if there is any interference with its passage along the route described above, then irregularity of the heart is sure to occur.

Sinus arrhythmia.

During the physical examination of the cardio-vascular system in children it is by no means uncommon to find cases of marked irregularity of the cardiac rhythm.

In some of these cases, however, if the child is told to hold his breath, the pulse is found to become regular.

This condition is known as sinus arrhythmia.

The phenomenon is not confined to children; it can often be produced in healthy adults during deep respiration.

In such cases the impulse starts, as it should, at the normal pace-maker, but instead of being repeated at regular intervals of time, it occurs irregularly.

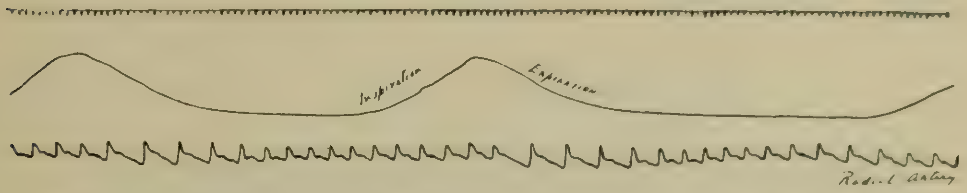

Fig. 2.—A simultaneous respiratory and pulse tracing, shewing typical irregular cycles of the radial artery during each respiration. The upstroke of the respiratory curve occurs during inspiration, the downstroke during expiration. Note the acceleration of the pulse during each inspiration, and the corresponding retardation during expiration.

If one examines the radial pulse in a case of sinus arryhthmia, the most striking feature of the irregularity is that definite cycles of irregularity repeat themselves with each respiration. During inspiration the pulse not only becomes more rapid but also considerably smaller in volume, whereas in expiration the rate is slower but the volume greater. (Fig. 2.)

Extrasystoles.

Although the cardiac impulse normally begins at the pace-maker, sometimes the impulse arises spontaneously at some point in the wall either of the auricles or of the ventricles, giving rise to a premature beat.

By means of polygraphic records it is quite easy to determine whether a premature beat has arisen in the ventricle or in the auricle. If one studies a radial pulse tracing in a case where the regular rhythm is upset by premature ventricular contractions, the following characteristic features can be noted :—

First, the pause preceding the premature beat is shorter than any single one of the pauses preceding the normal beats.

Secondly, the pause following the premature beat is longer than the interval between any two normal beats.

Thirdly, the short pause preceding the extrasystole, together with the long pause following it, are equal in length to two normal pauses. In other words, the long pause compensates for the short pause which immediately precedes the premature beat. (Fig. 3.)

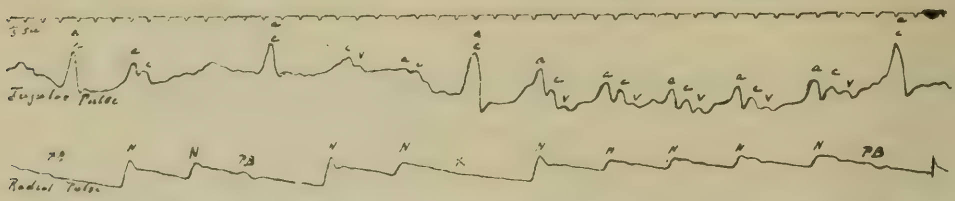

FIG. 3.—A typical polygraphic record of a case of Premature Ventricular Contractions. In the radial tracing the normal beats are marked N, the premature beats are marked P.B. There is one long pause shewn where no premature contraction appears; however, there has been a premature beat, as shewn by the jugular tracing, but this beat has been too feeble to reach the radial artery. In the jugular tracing "a," "c" and "v" waves are seen corresponding with each normal radial beat, but at each place where a premature beat occurs a high peak is seen—this is labelled $\overset{\text{“a”}}{\text{“c”}}$ because the "c" wave has occurred where normally the "a" wave would have been situated.

The jugular tracing also shews characteristic features; while the heart beats regularly the usual cycle of "a," "c" and "v" waves can be clearly seen. When, however, the ventricle contracts prematurely, the "c" wave corresponding to this extrasystole becomes superimposed upon the "a" wave which has occurred at its normal time; therefore, instead of finding two separate waves, namely, "a" and "c" waves, one finds one tall wave which must be an "a" and "c" wave together. (Fig. 3.)

When the cardiac rhythm is upset by extrasystoles arising in the auricles, the polygraphic records obtained from such cases have quite a different appearance.

In the radial tracing the pause following the premature beat is longer than the pause after a normal beat, but it is not long enough to compensate fully for the short pause immediately preceding the extrasystole. Therefore, the short pause, together with the long pause, are not equal to, but are shorter than, two normal pauses.

The jugular tracing will not shew any abnormally high peaks such as were found in the case of ventricular extrasystoles, because the systole of the ventricles does not coincide with the systole of the auricles. The "a" waves will occur in a perfectly regular sequence until the disturbance occurs, when the "a" wave due to the extrasystole will be found to occur prematurely in the tracing. (Fig. 4.)

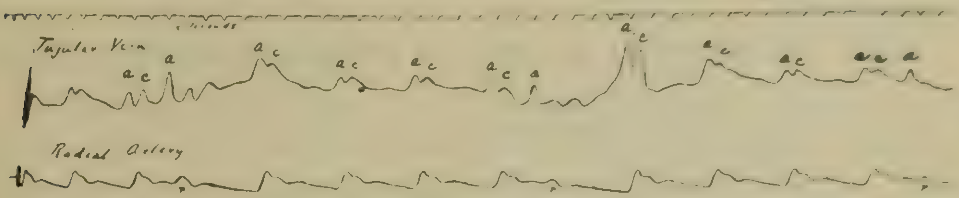

Fig. 4.—Typical polygraphic tracings from a case of Premature Auricular Contractions. The extrasystoles are marked P in the radial curve. The pause after each extrasystole is longer than the pause between any two normal beats. The short pause preceding the premature beat, together with the long pause after it, are shorter than any two consecutive normal pauses. In the venous curve the "a" waves are seen to occur prematurely at the places corresponding to the waves marked P in the arterial tracing.

Paroxysmal tachycardia.

This somewhat rare condition is closely allied to that of auricular extrasystoles. It is regarded by many authorities as a condition in which a series of premature auricular contractions occurs in rapid succession.

That the disturbance arises in the auricles rather than in the ventricles is shewn by electro-cardiographic records of cases taken during a paroxysm. The summit which occurs during each auricular systole is often found to be inverted during the paroxysm, though these summits may be shewn to appear normal when the paroxysm has passed off. It is also interesting to note that in many cases, soon after the paroxysm has ceased, the regular cardiac rhythm is interrupted by occasional auricular extrasystoles.

The paroxysm may continue for merely a few seconds; on the other hand, it may persist without interruption for several days.

The main features of a paroxysm as shewn by polygraphic records are as follows:—

First, the onset of the paroxysm is quite sudden. Before the onset nothing abnormal can be seen in either the radial or the jugular tracing.

Secondly, the pulse during the paroxysm is perfectly regular and very rapid.

Thirdly, the paroxysm terminates just as abruptly as it commences, and this termination is still more marked, because it is immediately followed by a pause which is longer than a normal pause.

After the paroxysm is over the pulse very soon returns to its former normal rhythm, but a few extrasystoles arising in the auricles may often be seen just after the paroxysm has passed off. (Figs. 5 and 6.)

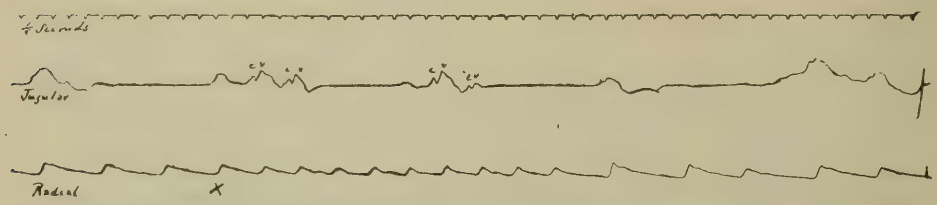

FIG. 5.—The radial tracing shews the onset of a paroxysm. The first three beats (reading from left to right) are followed by normal pauses, but at the point marked × the beats suddenly become much more rapid, though they still remain quite regular during the paroxysm.

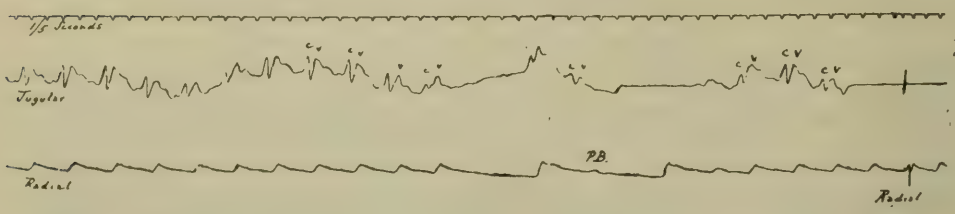

FIG. 6.—The termination of a paroxysm. Note the long pause at the end of the paroxysm. This pause is followed by an extrasystole (marked P.B.), and this is immediately followed by a fresh paroxysm.

It often happens that during a paroxysm no sign of any "a" waves can be found in the venous curve; this condition is known as the ventricular type of venous pulse.

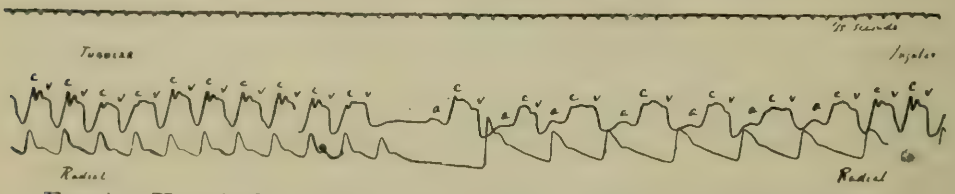

FIG. 7.—Ventricular type of Venous Pulse. Note the complete absence of "a" waves during the paroxysm. When the pulse is slow the "a" waves are clearly seen in the venous tracing.

After the paroxysm is ended the "a" waves appear as in a normal venous tracing. (Fig. 7.)

Auricular fibrillation.

In the condition described as auricular fibrillation no regular series of impulses are set up in the normal pace-maker of the heart. The auricles are in a state of dilatation, and no true auricular systoles occur.

Although the auricles are in a condition of dilatation, the actual fibres of the walls of the auricles are undergoing alternate contraction and relaxation at an extremely rapid rate, but only a few impulses from the auricles are able to make their way along the auriculo-ventricular bundle, to cause contractions of the ventricles. These impulses, which do reach the ventricles, have no regular sequence at all; consequently the ventricular systoles are extremely irregular.

Polygraphic records of cases of auricular fibrillation usually shew quite characteristic features.

The pulse rate may vary enormously in different cases, sometimes being only about 80 beats per minute, but more often over 100 beats a minute.

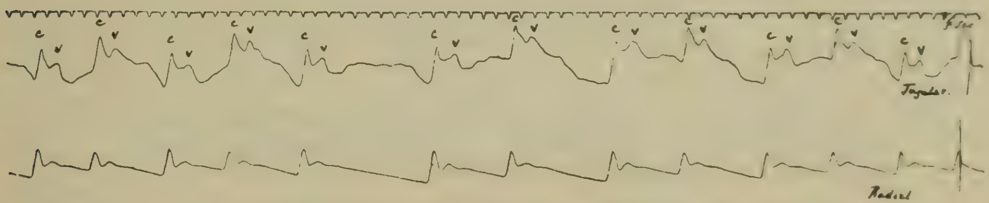

FIG. 8.—A typical example of Auricular Fibrillation, shewing gross irregularity of the pulse. Note the complete absence of "a" waves in the jugular tracing.

The radial beats occur at markedly irregular intervals, and the height of the individual beats is extremely variable.

In the jugular tracing the "c" waves are seen to occur very irregularly. There is complete absence of "a" waves. The "v" waves are usually present, but the "c" and "v" waves very often form irregular series of plateaux, each one corresponding to one of the radial beats. Sometimes during the longer diastolic pauses a definite wave appears in the jugular tracing; this wave may have the appearance of a normal "a" wave, but it is really only a stasis wave, and is not due to any true auricular systole. These waves are usually labelled "h" waves.

If there is any doubt as to whether these occasional waves are really "a" or "h" waves, it can quite easily be determined by careful measurement. Waves which are due to auricular systoles will bear a definite relation to the "c" waves immediately succeeding them. Stasis waves, on the other hand, may occur at any time during the diastolic period. (Fig. 8.)

When the pulse rate is slow one occasionally finds numerous small waves occurring during the diastolic periods in the jugular tracing. These waves probably represent some of the actual fibrillations themselves, and are known as "f" waves. (Fig. 9.)

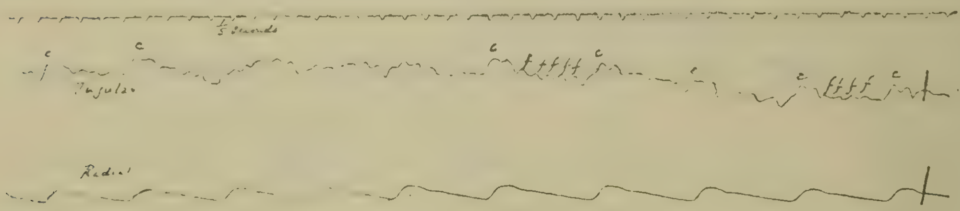

Fig. 9.—This is a case of Auricular Fibrillation in which the fibrillary contractions are very well marked. These are labelled "f" waves.

Heart block.

By the term heart block is meant a condition in which there is some delay in the passage of the impulse from the auriculo-ventricular node to the ventricles. The actual focus of disease causing this delay is situated somewhere in the auriculo-ventricular bundle or in one of its main divisions.

Different stages of heart block have been described, and each of these stages can be recognised by means of polygraphic records.

In the earliest stages of this disease there is simply an increase in the interval of time which elapses between the onset of auricular systole and the onset of ventricular systole. Normally this interval is slightly less than one-fifth of a second; if it is more than one-fifth of a second, there is some slight degree of heart block. Polygraphic records of such a case would shew a perfectly regular pulse, but there would be a slight increase in the "a—c" intervals of the venous curve. (Fig. 10.)

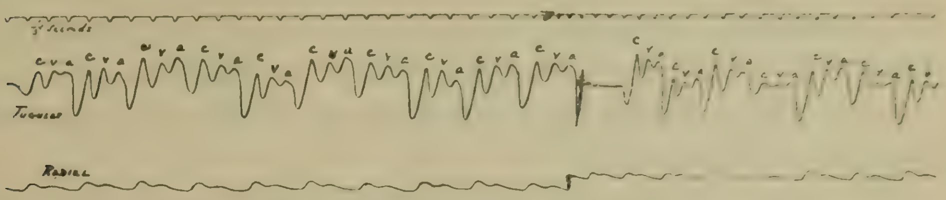

FIG. 10.—The venous tracing shews slight increase in the "a—c" interval, indicating that there is a condition of early heart block.

As the degree of block increases a time is reached when occasional impulses are unable to reach the ventricles, so that the ventricle misses a beat from time to time. As the polygraphic records of these cases are often difficult to decipher, I have represented the condition diagrammatically in Fig. 11.

The upper row of vertical lines represents the contractions of the auricles, the oblique lines shew the time taken by the impulse to pass from the auricle to the ventricle (*i.e.*, the "a—c" interval), and the lower series of vertical rectangles represents the contractions of the ventricle, due to the stimuli which have traversed the auriculo-ventricular bundle.

Note the progressive lengthening of the "a—c" intervals

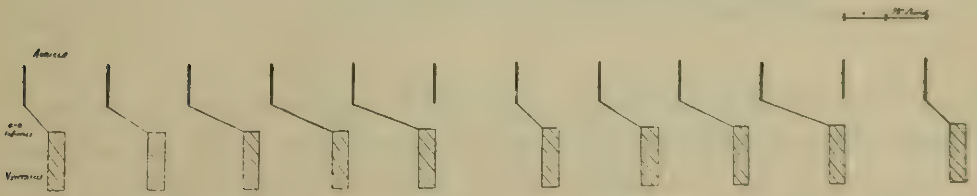

FIG. 11.—Diagrammatic representation of a case of Heart Block, shewing the phenomenon known as "dropped" beats.

until a beat is missed. This lengthening occurs in a very definite manner; although the auriculo-ventricular interval becomes successively longer, the individual degree of lengthening is successively shorter. In other words, the relative increase in the "a—c" interval of the 2nd beat to the "a—c" interval of the 1st beat is greater than the relative increase of the "a—c" interval of the 3rd beat to the "a—c" interval of the 2nd beat. This condition will apply up to the 6th auricular beat in Fig. 11. The impulse from this 6th auricular beat is unable to make its way through the bundle, therefore there is no ventricular systole corresponding to that auricular beat. This, then, is a dropped beat, and as a result of this long interval, the muscle of the ventricle gets a longer period of rest than it normally does.

The next impulse coming from the auricle meets with very little resistance to its passage along the bundle; consequently the "a—c" interval is not prolonged; but each succeeding auricular impulse has progressively increasing difficulty in reaching the ventricle, so that the "a—c" interval becomes progressively longer until another beat is dropped.

From this it will be evident that the ventricular systoles gradually become more frequent, not only before but also immediately after a beat is missed.

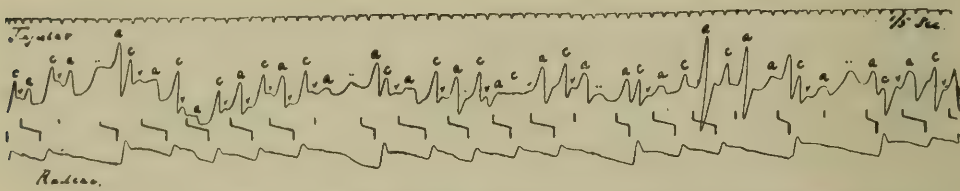

FIG. 12.—A case of Heart Block, shewing occasional "dropping" of beats. Note the occasional long pauses in the radial tracing with acceleration of the beats before and after each long pause. The oblique lines between the jugular and radial curves are approximate measurements of the varying "a—c" intervals.

The radial tracing of a polygram illustrating this degree of heart block will merely shew occasional long pauses with acceleration of the radial beats preceding and following these long pauses. (Fig. 12.)

The jugular tracing shews progressive lengthening of the "a—c" intervals until a beat is missed, where no "c" wave will be found corresponding to one of the "a" waves. (Fig. 12.)

As the degree of heart block increases, the number of ventricular beats which are "dropped" gradually increases, until a stage is reached where only every alternate auricular contraction causes a response in the ventricles. This is known as two to one heart block. Such cases shew no prolongation of the "a—c" intervals, because the heart muscle gets sufficient rest while the beat is missed to respond to the next auricular impulse.

The pulse is quite regular, but rather slower than normal.

The jugular tracing of a polygram would shew the existence of two "a" waves to each "c" wave. (Fig. 13.)

With increasing resistance to the passage of the impulse through the auriculo-ventricular bundle, the ventricle may only contract once to every three or four or even six auricular contractions, so that many different pictures could be taken, all of which would illustrate different grades of heart block.

In the most extreme degree of heart block no impulse is able to traverse the bundle. When this occurs the ventricle creates a stimulus in its own muscular wall, and a regular series of ventricular contractions is set up, usually from thirty to forty times a minute.

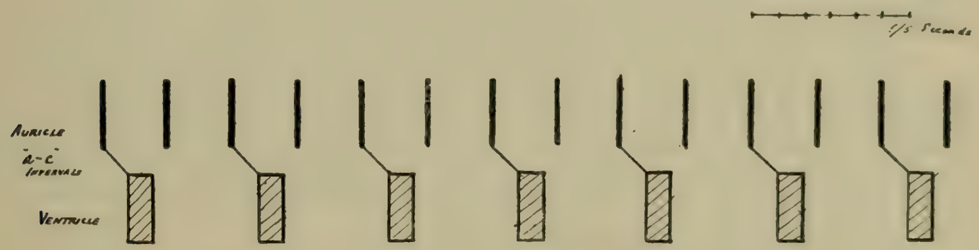

Fig. 13.—A diagrammatic representation of a case of two to one Heart Block.

The radial tracing of a polygram taken from a case of complete heart block shews a regular series of beats occurring at a very slow rate.

In the jugular tracing "c" waves are found corresponding to each radial beat. The "a" waves also appear at regular intervals, but at the normal rate.

The most characteristic feature, however, of the polygram is the entire dissociation between the "a" and the "c" waves.

As the ventricular rhythm is quite independent of the auricular rhythm, sometimes the auricle and ventricle contract simultaneously so that the "c" wave is superimposed upon the "a" wave. Other "a" waves may immediately precede or succeed the "c" wave, or may occur at any time during ventricular diastole. (Fig. 14.)

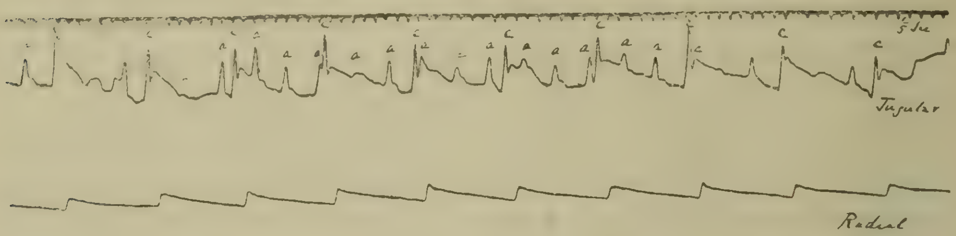

FIG. 14.—A case of complete Heart Block. Pulse rate 37 beats per minute. Note the regularity of the "c" waves, and the independent regular series of "a" waves occurring about 90 times a minute.

Passing now from cases where there is irregularity in the intervals between the beats, conditions can be demonstrated where there is irregularity in the force of the radial beats, though there is no irregularity in the time of the beats.

The condition in which this phenomenon is most marked is that of the pulsus paradoxus. In a patient who shews this form of irregularity it is found that the radial beats become markedly weaker or even altogether lost every time the patient breathes deeply. (Fig. 15.)

Another cause of irregularity in force of the radial beats is that which occurs in association with grave degenerative changes in the heart muscle. The condition is called the pulsus alternans, on account of the occurrence of alternate large and small beats of the radial artery.

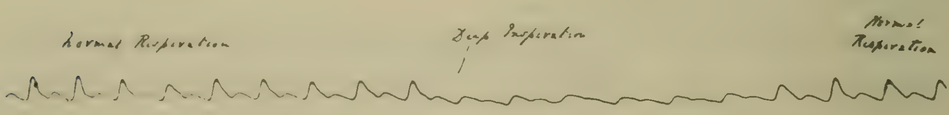

FIG. 15.—Radial tracing shewing the Pulsus Paradoxus.

In conclusion, I should like to thank the physicians of the Middlesex Hospital, who have so kindly allowed me full facilities for taking polygraphic tracings of their patients in the Hospital. I am also deeply indebted to Dr. Stott, who very kindly gave me the polygraphic records of the stage of heart block where from time to time a ventricular beat is dropped.

LACTIC ACID IN BACILLUS COLI INFECTIONS.

By I. H. LLOYD-WILLIAMS, M.R.C.S., L.R.C.P.

The therapeutic value of lactic acid in Bacillus Coli infections is a subject on which the usual text-book is silent, though its use as a spray in tubercle of the larynx is a recognized method of treatment. The following notes may therefore be of interest.

It will be as well to consider first several points in this connection from the bacteriological aspect, as these throw light on the clinical use of lactic acid.

The Bacillus Coli is an organism closely allied to the Bacillus Typhosus and B. Enteritidis. This group has its normal habitat, so far as the human subject is concerned, in the intestine and more particularly the colon and lower part of the ileum. Coliform organisms are constantly present in the healthy intestine.

Morphologically it is a motile rod possessed of about four flagella placed at the end. The motility is variable, as is the length, which is usually about 2 μ. The organism is gram-negative and is stained well by the ordinary aniline dyes, such as methylene blue.

The cultural properties are fairly characteristic. In a gelatin stab culture it grows well with the formation of gas. Milk is curdled and rendered acid by fermentation of the lactose present, this sugar being converted into lactic acid. The organism grows well on MacConkey's media, which contain bile salts, the colour being altered to a redder tint.

The formation of lactic acid is of interest as an example of the law that the growth of an organism is inhibited when its fermentative products reach a certain concentration, which concentration depends on the product formed and the particular organism in question.

The following experiments shew the inhibitory action of lactic acid on the B. Coli. The culture of this bacillus was the same for both experiments and was taken from the pus of an appendix abscess.

Experiment I.—A set of ordinary gelatin tubes were taken and lactic acid added to a strength of 1 per cent. A similar number of control tubes were taken, but without the acid. These tubes were then inoculated with B. Coli and converted into "shake-cultures"; the tubes were then incubated for forty-eight hours. At the end of this time it was observed that there was no growth in the lactic tubes, as indicated by the formation of gas, whilst it was present in the controls.

Experiment II.—In this, advantage was taken of the free formation of the acid at present under consideration by the Bacillus Acidi Lactici. A MacConkey gelatin plate was taken and inoculated in a series of parallel lines with a culture of this organism. B. Coli was then inoculated on to the plate in a series of lines at right angles to the original ones. After incubation it was observed that growth was much less profuse where the organisms were mixed than when only one was present.

The following cases shew the clinical value of lactic acid treatment. The value of lactic acid in stopping suppuration is apparently most marked when the Bacillus Coli is in pure culture.

Case I.—An appendix abscess occurring in a boy of 14. The abscess was opened and drained. The stitches cut through and the wound gaped. The edges of the wound became covered with unhealthy granulations; not much improvement occurred whilst it was dressed with plain sterile gauze. The cavity was irrigated for some days with creolin ♏ 10 ad. Oj, without much improvement of the superficial parts. Gauze was then applied which had been previously soaked in a 10 per cent. aqueous solution of lactic acid, the abscess cavity being irrigated as before. Within twenty-four hours of the application the wound had cleaned up markedly, and recovery progressed favourably.

Case II.—A typical appendix abscess in a man of about 35, which was opened and drained. Several subcutaneous suppurating tracks developed in connection with the stitches; these had to be opened. A similar application of lactic acid as in the first case quoted was used, but with not quite such rapid results.

Case III.—A man, aged 60, admitted with carcinoma of the rectum. Abdomino-perineal excision of the growth was carried out, the cocyx having to be excised in order to deliver the mass through the perineal wound. Infection of the perineal wound occurred and the stitches cut through. Organisms found in the pus were B. Coli and pyococci; these most probably escaped from the rectum, which was injured during removal. The cavity was irrigated with creolin ♏10 ad Oj; lactic acid 10 per cent. in glycerin was then injected into the cavity with a syringe and the cavity finally plugged with gauze soaked in the same solution. Considerable improvement occurred, the pus becoming less and the cavity granulating up nicely.

Case IV.—A man of 45 admitted with operable carcinoma of the rectum. Abdomino-perineal excision was practised. The post-operative treatment was similar to that in Case III., and was equally successful.

It has been argued that 10 per cent. is too strong, and that the glycerin would act deleteriously on the granulations through its dehydrating action on the granulation tissue. This strength of acid caused a certain amount of smarting, which did not last more than about half-an-hour. It is worth bearing in mind that in these cases there was a fair amount of secretion, which would necessarily dilute the solution and so neutralize its effect.

Case V.—A man admitted with inoperable carcinoma of rectum. Colostomy was performed. There was a foul discharge present, which was passed per anum. The rectum was irrigated from the colostomy opening with a 10 per cent. aqueous solution of lactic acid. This had practically no effect on the discharge, which was most probably the result of the carcinomatous ulcer breaking down.

Case VI.—A girl, aged 19, was admitted with pain in the left inguinal region. There was induration felt on pelvic examination—some induration of the broad and utero-sacral ligaments. The patient had suffered from subphrenic and appendix abscesses which had been opened. There was a fistulous track in the middle line in the scar, which was the result of a previous laparotomy. On operation to close the track, it was found to go down to the ovaries, which were diseased; salpingo-oöphorectomy was performed. Pathological examination shewed actino-mycotic disease of ovary. A drainage tube was put into the pelvic cavity and the wound stitched up. A fistula remained after the removal of the tube; pus was plentiful and malodorous, containing B. Coli. The wound was irrigated with a 2 per cent. aqueous solution of lactic acid. The condition of the wound rapidly improved, pus becoming less and the granulation becoming healthy.

HOURS OF HOSPITAL VISITS, Etc.

	IN-PATIENT DEPARTMENTS.	M.	T.	W.	Th.	F.	S.
General Medicine	Dr. William Pasteur	...	1.30	...	...	1.30	...
	Dr. W. Essex Wynter	1.30	...	...	1.30	...	...
	Dr. Arthur F. Voelcker	1.30	...	...	1.30	...	...
	Dr. F. J. Wethered	...	1.30	...	...	1.30	...
General Surgery	Sir Alfred Pearce Gould	...	1.30	...	...	1.30	...
	Sir John Bland-Sutton	...	1.30	...	...	1.30	...
	Mr. J. Murray	1.30	...	...	1.30	...	...
	Mr. T. H. Kellock	1.30	...	...	1.30	...	...
Operations		1.30	1.30	1.30	1.30	1.30	1.30

	OUT-PATIENT DEPARTMENTS.	M.	T.	W.	Th.	F.	S.
General Medicine	Dr. R. A. Young	...	1.30	...	...	1.30	...
	Dr. C. E. Lakin	1.30	...	...	1.30	...	...
	Dr. MacCormac	...	...	1.30	...	...	1.30
General Surgery	Mr. W. Sampson Handley	1.30	...	...	1.30	...	...
	Mr. Gordon Taylor	...	1.30	...	...	1.30	...
	Mr. Alfred E. Johnson	...	...	1.30	...	...	1.30

SPECIAL DEPARTMENTS.	M.	T.	W.	Th.	F.	S.
Obstetrics and Gynæcology:						
Mr. Comyns Berkeley (In-Patients)	...	1.30	...	1.30	...	...
Mr. Victor Bonney (Out-Patients)	9	...	9.30	...	...	...
Diseases of the Skin:						
Dr. J. J. Pringle (In-Patients)	...	...	2.30	...	...	...
Dr. MacCormac (Out-Patients)	...	2.30	...	...	2.30	...
Diseases of the Nervous System:						
Dr. Campbell Thomson	...	...	...	1.30	...	10
Diseases of the Eye:						
Mr. Arnold Lawson (In-Patients)	2	...	...	2	...	...
Mr. Arnold Lawson (Out-Patients)	...	9	...	...	9	...
Mr. R. Affleck Greeves (Out-Patients)	...	9	...	9	...	...
Diseases of the Ear and Throat:						
Mr. Somerville Hastings						
(Out-Patients)	...	9	...	...	9	...
(In-Patients)	11	...	...	...	...	...
Diseases of Children: Dr. E. A. Cockayne	...	...	9	...	...	9
Diseases of the Teeth: Mr. H. W. Turner	...	...	9	...	9	...
Mr. James	9	...	9	...	...	...
Cancer: Sir Alfred Pearce Gould	...	...	1	...	...	...

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LONDON, W.

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For further information apply to

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J. Strickland Goodall, M.B. (Lond.), F.R.C.S., F.R.S. (Ed.), Sub-Dean.